

Delivering Disease Prevention[®]



Making New York a Healthier and Safer Place to Live
Public / Private Integrated Tick Management
May 14, 2019

Global Challenge – Zoonotic Disease

- Animal-borne diseases (zoonotic) are the #1 source of global infectious disease.
- 60% of existing and 75% of emerging human infectious diseases have an animal origin.
- 2.5 billion people are infected each year by zoonotic disease.
- 2.7 million people die each year from zoonotic disease.
- The equivalent of one death every 12 seconds.



Zoonotic Disease Today

Ebola



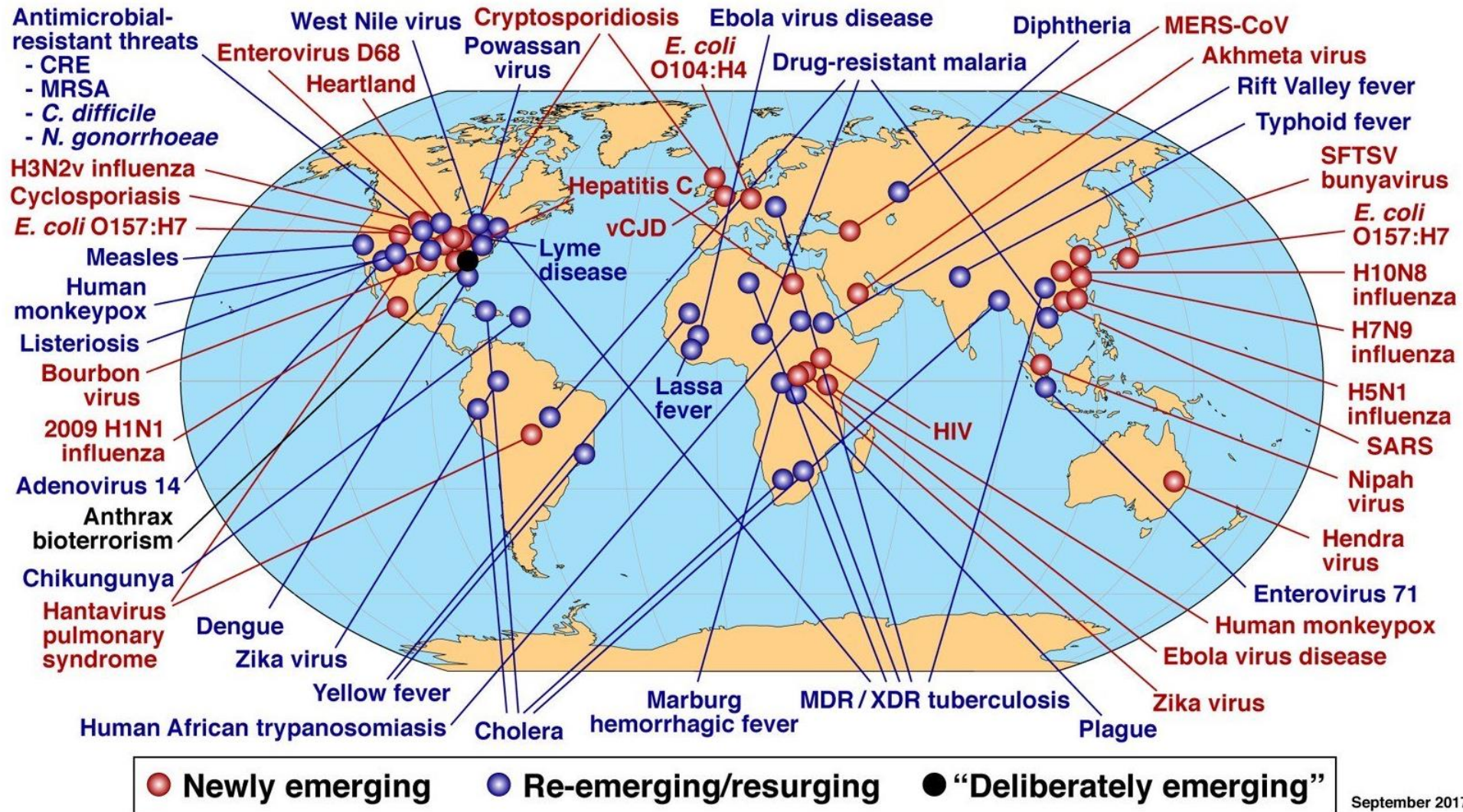
Lyme



Zika

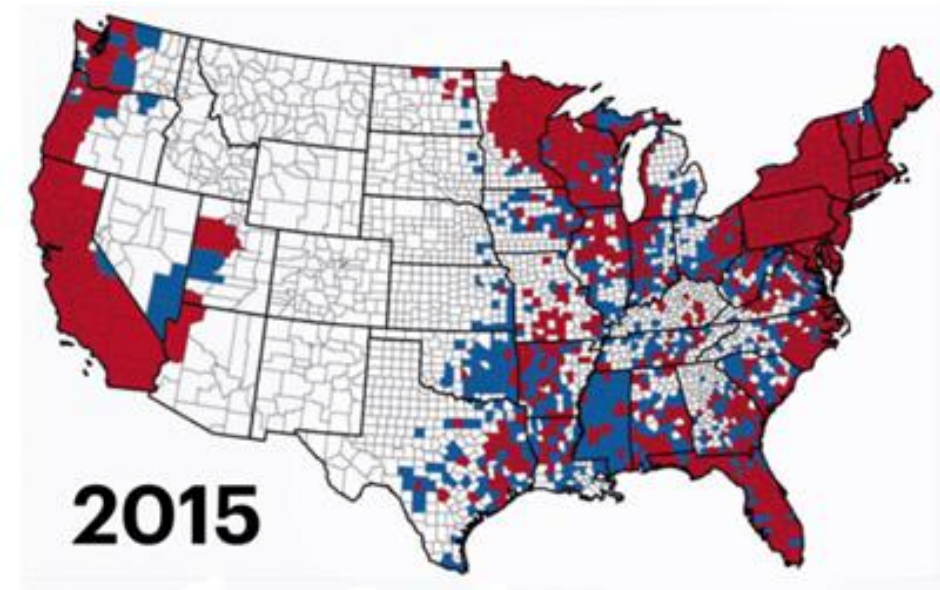
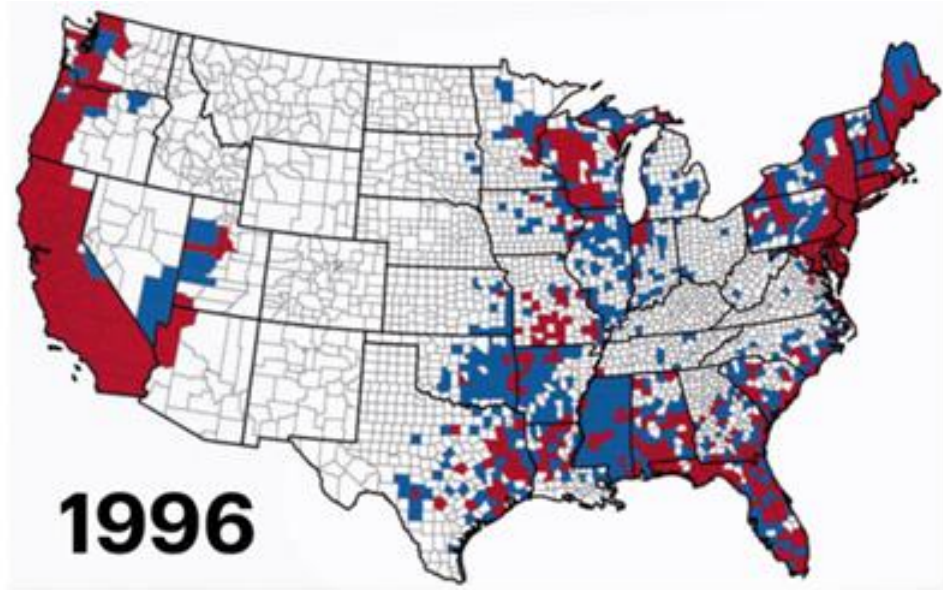


Global Zoonotic Disease Hot Zones



September 2017

U.S. Lyme Disease Epidemic



“Regions where ticks that carry Lyme are established (red) or reported (blue).”

300,000+ new U.S. Lyme disease cases annually and Lyme-carrying ticks have now spread to half of all U.S. counties

Reported Lyme Disease Cases by NY County

	2013	2017			2013	2017			2013	2017			2013	2017
ALBANY	220	459		FRANKLIN	7	41		ONONDAGA	49	128		STEUBEN	9	105
ALLEGANY	4	14		FULTON	9	40		ONTARIO	7	62		SUFFOLK	689	523
BROOME	64	400		GENESEE	1	8		ORANGE	545	521		SULLIVAN	85	38
CATTARAUGUS	3	29		GREENE	203	358		ORLEANS	0	2		TIOGA	27	123
CAYUGA	3	20		HAMILTON	0	1		OSWEGO	17	125		TOMPKINS	87	185
CHAUTAUQUA	6	4		HERKIMER	23	48		OTSEGO	32	187		ULSTER	370	419
CHEMUNG	6	115		JEFFERSON	43	67		PUTNAM	242	346		WARREN	33	24
CHENANGO	14	127		LEWIS	7	19		RENSSELAER	506	633		WASHINGTON	119	86
CLINTON	9	55		LIVINGSTON	1	14		ROCKLAND	241	207		WAYNE	2	21
COLUMBIA	342	434		MADISON	6	67		ST. LAWRENCE	50	230		WESTCHESTER	211	407
CORTLAND	7	46		MONROE	40	184		SARATOGA	340	316		WYOMING	2	2
DELAWARE	13	124		MONTGOMERY	20	42		SCHENECTADY	34	115		YATES	5	56
DUTCHESS	435	581		NASSAU	56	128		SCHOHARIE	12	59		NYS EXCL NYC	5344	8720
ERIE	11	89		NIAGARA	1	7		SCHUYLER	14	46		NYC***	543	1083
ESSEX	22	121		ONEIDA	36	96		SENECA	4	18		NYS TOTAL	5887	9803

Cost of Lyme Disease in New York

NYDOH Recorded 2017 Cases

<https://www.health.ny.gov/statistics/diseases/communicable/2017/>

9,803

Direct Medical Costs, Indirect Medical Costs, Lost Income, Lost Taxes, and Related Lyme Disease Costs Per Case as reported in the CDC's *Emerging Infectious Diseases* and adjusted for 2019 dollars.

X \$11,730

Total Annual
Cost Burden

\$114,989,190

Note – According to the [Centers for Disease Control and Prevention](#) this calculation is likely to be underreported by a factor of 10X. If so, this would equate to an annual cost burden to the state of NY of over **\$1 billion**.

The Expanded Cost of Lyme Disease

*“As people across the northeastern U.S. begin venturing back into the outdoors with the arrival of spring, they will make **1 billion fewer trips** than they otherwise would have if Lyme disease didn’t exist”, a new [Yale study](#) concludes.*

“Lyme disease has been around for a few decades, but it still has a big cost to society. But the cost is not what people spend on doctors, or medicine, or even bug spray.”

Eli Fenichel, assistant professor at Yale Forestry & Environmental Studies

“People are giving up trips, and it’s not just hiking and camping in the woods. It’s trips to the park, soccer games, or walks and bike rides in places where there are stands of trees and tall grasses.”

Kevin Berry, University of Alaska, Anchorage, former Forestry & Environmental Studies postdoctoral fellow



Integrated Tick Management



**Host and
Vector Control**



***US BIOLOGIC*
Lyme Vaccine**



Education

Integrated Tick Management

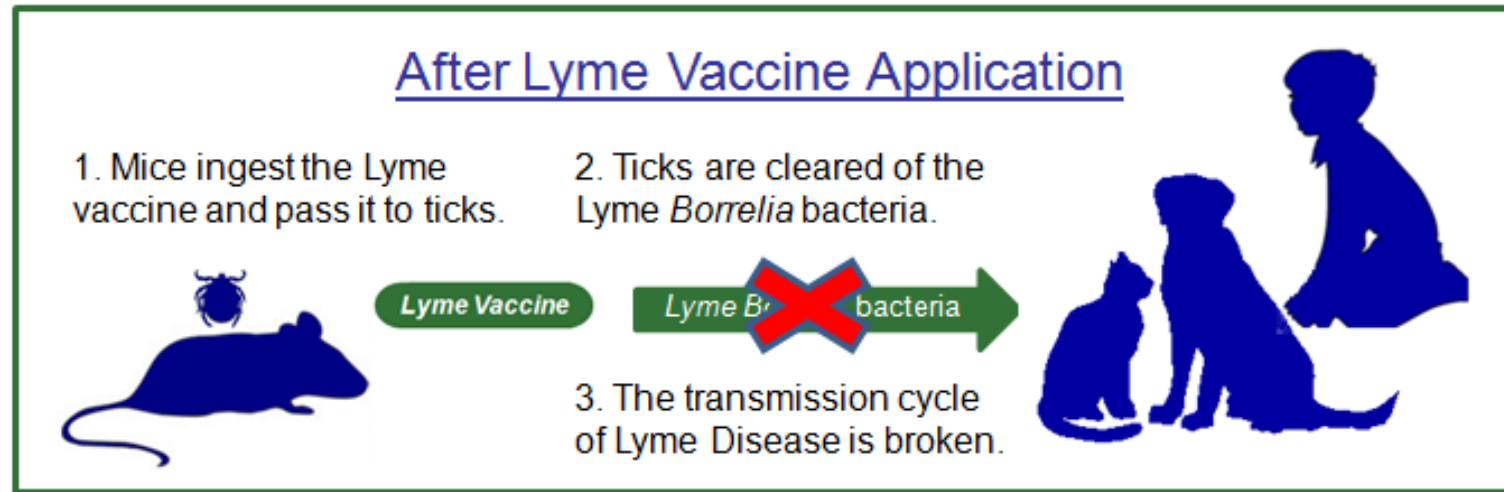


Landscaping



Behavioral

Preventing Tick-borne Disease at the Source



Replicated Disease Prevention Study Results

Cary Institute of Ecosystem Studies

- 2007-2012
- Millbrook, New York
- Open field; trapped feeding; live vaccine
- Significant (75%+) reduction in infected ticks



Connecticut Agricultural Experiment Station

- 2014-2016
- Redding, Connecticut
- Residential; open feeding; inactive vaccine
- Significant reduction in infected mice & ticks



Both Public and Private Protection is Important



Recreational Areas

- Parks, playgrounds, campgrounds, hiking trails, golf courses, sports fields, etc.



Trails

- Fields, forests, etc.
- Alongside lakes, rivers, etc.

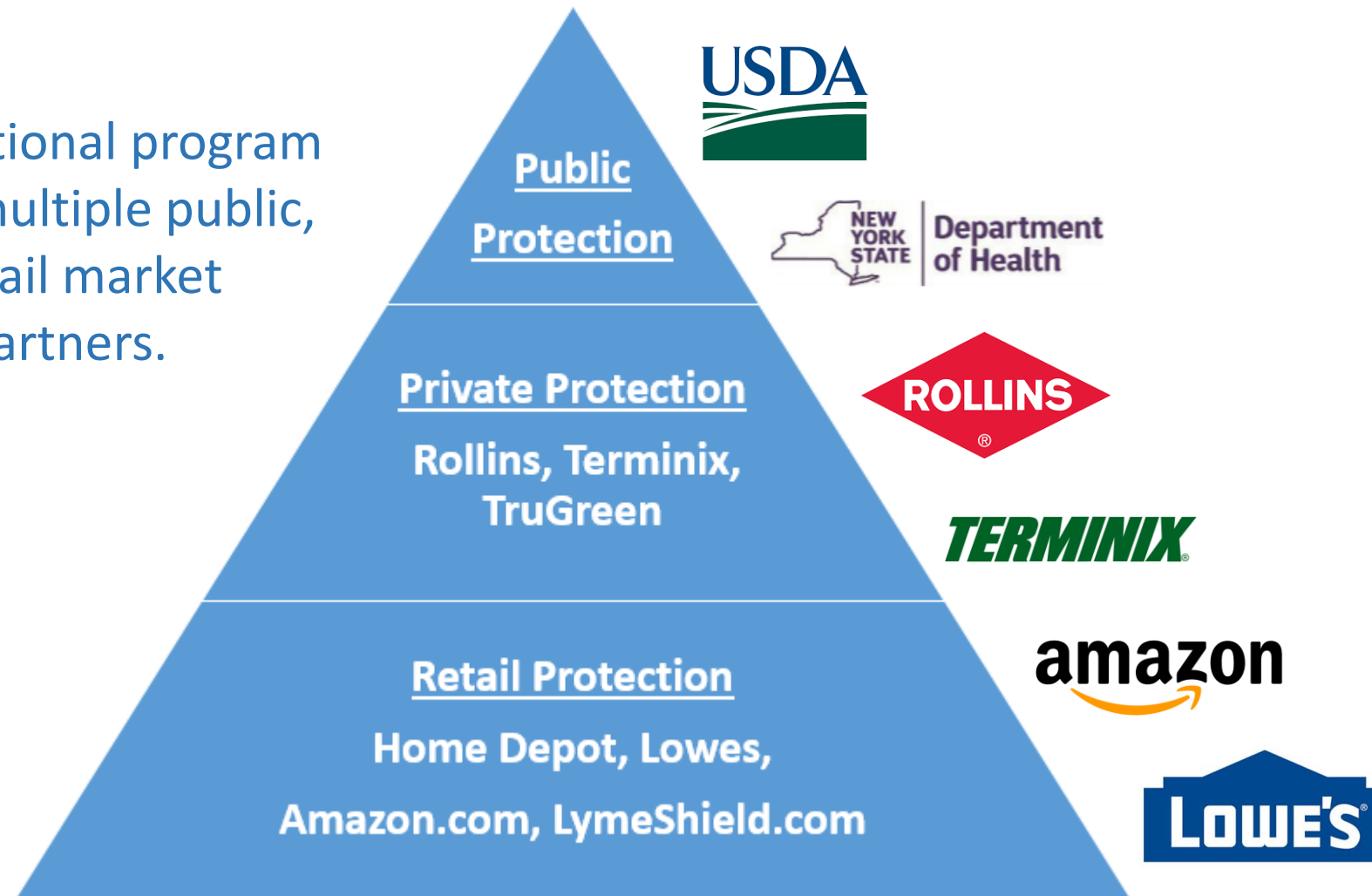


Private Application

- Residential, universities, schools, camps, corporate campuses, golf courses, etc.

National Program Implementation

An effective national program must address multiple public, private, and retail market channels and partners.



Global Tick-borne Disease Prevention

Year-Round Protection

**Neighborhood
Protection**

**Residential
Protection**

**Multiple Pathogen
Protection**

**Public Lands
Protection**

Pet Protection

Livestock Protection

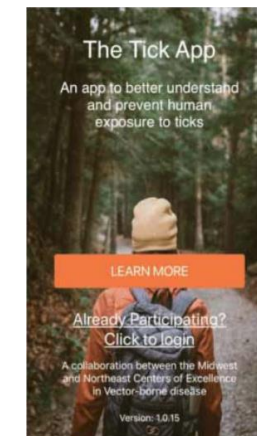
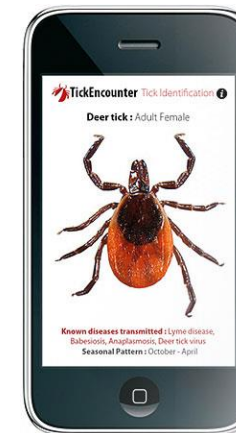


Environmental Protection

Tick Monitoring Apps

There are several excellent tick data collection and information toolsets. Three examples are:

- <https://livlymefoundation.org/>
- <https://thetickapp.org/>
- <https://tickencounter.org/>



ZooHUB - Proactive Identification of Lyme Disease Hot Spots

ZooHUB Predictive Analytics Proof of Concept Program

- 20 years of tick data analyzed
- Satellite and weather data for prediction
- Accounts for spatial correlation and temporal trends
- Natural criteria like waterways, vegetation, etc.
- Man-made criteria like roads, construction, etc.

Results

- Mapped tick infection areas with a 95% CI
- Ability to predict tick infection at a yard-level
- Immediate guide for proactive disease intervention
- Open public source and commercial plans



ZooHUB Application Layering and Data Integration

Weather

- Temperature
- Precipitation

Barriers

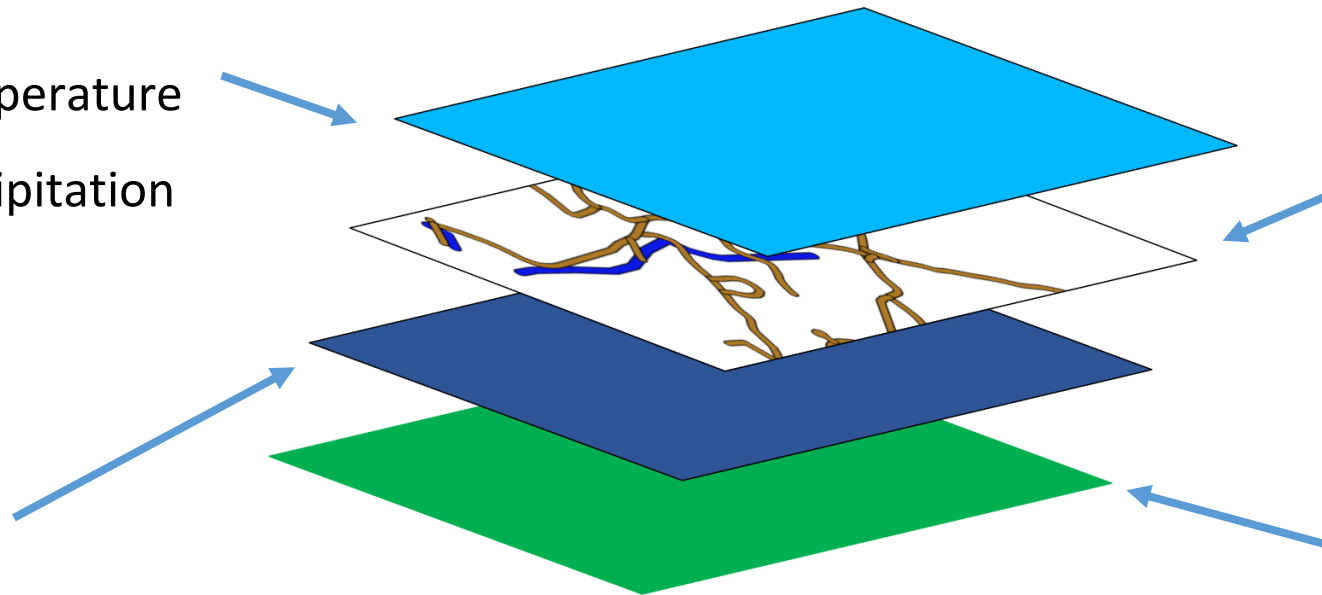
- Roads
- Waterways

Satellite

- Vegetation
- Elevation

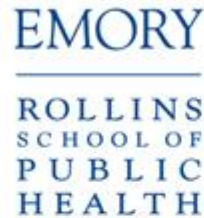
Host / Vector Data

- Abundance
- Infection



ZooHUB enables the integration of multiple data layers in a free-to-access cloud storage facility.

Strategic Public/Private Partnerships



Multi-Disciplinary Team of Leaders



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Steve Zatechka, PhD
Chief Science Officer



Jolieke G. van Oosterwijk,
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Luciana Richer, DVM
Laboratory Director
& Principal Scientist



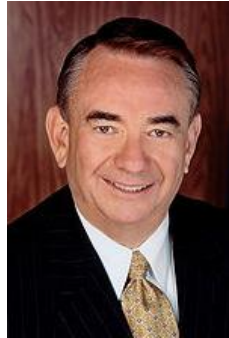
Maria Gomes-Solecki, DVM
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Retired Director, CDC
Retired Chief, USAMRIID



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Kirby Stafford, PhD
Chief Scientist / State
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Additional Resource Links

- [Tick Management Options](#); Public Tick IPM Working Group
- [Scientific American](#); Angus Chen; Published 1/29/2019
- [Science](#); Jennifer Couzin-Frankel; Published 4/17/2019
- [Lyme Disease Resources](#); CDC
- [Lyme Disease Resources](#); Cary Institute of Ecosystem Studies
- [Residential Programs](#); *US BIOLOGIC*
- [Public Programs](#); *US BIOLOGIC*